Application No. 10/815024   - 2 -   Docket No.: T0529.70016US00
Preliminary Amendment dated October 31, 2005
Reply to Office Action of September 29, 2005

AMENDMENTS TO THE CLAIMS

1.   (Currently Amended) A method of measuring duty cycle of an interval of a signal, comprising the acts:

     a)   providing as an input signal repetitions of the interval of the signal;

     b)   making a plurality of comparisons of the value of the input signal to a threshold at controlled times relative to the start of a repetition of the interval, making the plurality of comparisons including varying the controlled time; and

     c)   computing a duty cycle, based on the number of comparisons having a value in a predetermined range relative to the threshold.

2.   (Original) The method of claim 1 wherein the signal is a digital clock and the interval is a positive integer multiple of the period of the clock.

3.   (Original) The method of claim 1 wherein the signal is a differential signal.

4.   (Original) The method of claim 3 wherein the input signal is a differential signal with two legs and comparing the value of the input signal to a threshold comprises comparing the voltage difference between the legs to the threshold.

5.   (Original) The method of claim 4 wherein the threshold represents the value at which the two legs have equal voltages.

6.   (Original) The method of claim 1 wherein the method is performed using automatic test equipment to make the plurality of comparisons and vary the controlled time.

7.   (Original) The method of claim 6 wherein making a plurality of comparisons also includes counting the number of comparisons having a value in the predetermined range relative to the threshold.

8. (Original) The method of claim 6 wherein the signal is generated by a semiconductor device under test connected to the automatic test equipment.

9. (Original) The method of claim 7 wherein making a plurality of comparisons comprises using a comparator having a strobe input.

10. (Original) The method of claim 9 wherein the automatic test equipment comprises a programmable timing generator providing a timing signal coupled to the strobe input of the comparator and varying the controlled time comprises changing the programming of the timing generator to change the time of the timing signal at the strobe input to the comparator.

11. (Original) The method of claim 7 wherein making a plurality of comparisons comprises running a test pattern a plurality of times, and varying the controlled time comprises varying the controlled time between runs of the test pattern.

12. (Original) The method of claim 11 wherein the pattern controls the tester to make X samples and the pattern is repeated Y times.

13. (Original) The method of claim 12 wherein the duty cycle is computed by dividing the number of comparisons counted by the product of X and Y.

14. (Original) The method of claim 7 wherein the automatic test equipment is used in the process of making semiconductor devices to measure the duty cycle of a signal produced by semiconductor devices being manufactured and the computed duty cycle is used to alter the process of making semiconductor devices.

15.   (Original) The method of claim 14 wherein the process of making semiconductor devices is altered by selecting those semiconductor devices having a duty cycle within a predetermined range for further processing.

16.   (Original) The method of claim 14 wherein the process of making semiconductor devices is altered by speed binning semiconductor devices based on the duty cycle of the device.

17.   (Original) The method of claim 14 wherein the process of making semiconductor devices is altered by adjusting parameters of fabrication equipment based on statistical properties of the measured duty cycles of signals generated by a plurality of semiconductor devices being manufactured.

18.   (Original) The method of claim 1 wherein the controlled times are controlled so that the plurality of comparisons are made at times relative to the start of a repetition of the interval that are uniformly distributed over the duration of the interval.

19.   (Currently Amended) The [[A]] method of measuring ~~the~~ duty cycle of ~~a signal~~ claim 1, the method being performed using automatic test equipment that can be programmed to run test patterns, the automatic test equipment having: i) a timing generator that generates strobe signals at programmable times; ii) a comparator that may be programmed to make a comparison of the value at its input to an expected value at times controlled by strobe signals from the timing generator; and iii) failure processing circuitry coupled to the output of the comparator that may be controlled to count the number of comparisons indicating that the value at the input of the comparator deviates from the expected value during a pattern, ~~the method comprising~~wherein:

ai)   the act (a) comprises providing the input signal ~~as an input~~to the comparator;

bii)   the act (b) comprises:

A)   running a pattern with the timing generator programmed to produce strobe signals with a first time relationship to the input signal, the pattern programming the

expect value of the comparator to be a value indicating that the input signal is in a

first logical state;

~~e~~B)   at the end of the pattern, recording the count of comparisons made by the

failure processing circuitry indicating that the value at the input of the comparator

deviates from the expected value; and

~~d~~C)   iteratively altering the programming of the timing generator to produce strobe

signals with a different time relationship to the input signal, re-running the pattern

and recording the count of comparisons indicating that the value at the input of the

comparator deviates from the expected value made by the failure processing

circuitry;

~~e~~iii)   the act (c) comprises computing the duty cycle of the input signal from the total

number of comparisons indicating that the value at the input of the comparator deviates from

the expected value made by the failure processing circuitry.

20.   (Original) The method of claim 19 wherein altering the programming of the timing

generator comprises incrementing by a fraction of a period of the signal the programmed time of the

strobe signal.

21.   (Original) The method of claim 19 wherein the strobe signals have a time relationship to the

signal that causes the comparator to make multiple comparisons to the signal in each period of the

signal.

22.   (Currently Amended) The method of claim 1 performed using ~~A~~automatic test equipment

programmed to measure the duty cycle of an input signal, the automatic test equipment comprising:

i) a timing generator that generates strobe signals at programmable times;

ii) a comparator having an signal input coupled to the input signal, a strobe input coupled to the

timing generator, a threshold input and an digital output having a state dependent on the relative

level at the signal input and the threshold input at a time dictated by the strobe input; and

iii) failure processing circuitry coupled to the output of the comparator that may be controlled to count the number of digital outputs of the comparator indicating that the value at the input of the comparator deviates from a programmable expected value; and

iv) a software program to control the automatic test system to perform a ~~the~~ method of claim 1, wherein~~comprising~~:

         ~~a~~i)   the act (b) comprises:

         A)   running a pattern with the timing generator programmed to produce strobe signals with a first time relationship to the input signal, the pattern programming the expect value of the comparator to be a value indicating that the signal is in a first logical state;

         ~~b~~B)   iteratively altering the programming of the timing generator to produce strobe signals with a different time relationship to the input signal and re-running the pattern;

         ~~e~~ii)   the act (c) comprises computing the duty cycle of the signal from one or more values counted by the failure processing circuitry indicating the total number of comparisons during all iterations of the pattern indicating that the value at the input of the comparator deviates from the programmed expected value.

23.   (Original) The automatic test equipment of claim 22 wherein the comparator is a differential comparator.

24.   (Original) The automatic test equipment of claim 22 additionally comprising a general purpose digital computer and the software runs on the general purpose digital computer.